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Some North American Botanists.

VIII. JOHN LEONARD RIDDELL.

There is little on record concerning the personal history of Professor Riddell. He early became a resident of the West, where, with the exception of an acquaintance with Sullivant, and possibly with Short, he was in almost complete isolation from the botanists of the time. He subsequently took up his residence in the South, where his botanical acquaintances, and the opportunities for reference and consultation seem to have been even less than in the West. The South and West of fifty years ago presented little opportunity for study aside from their comparatively unexplored floras.

John Leonard Riddell was born in Leyden, Massachusetts, February 20, 1807. He died in New Orleans October 7, 1865. When less than a year old he was taken by his parents to Preston, Chenango county, New York, where his father obtained a farm. During portions of the years 1826 and 1827 he attended Oxford Academy, and afterwards the Rensselaer School at Troy, where he obtained the degrees of A. B., and A. M. For several years from 1830 he gave lectures on various scientific topics in many places in the United States and Canada. These lectures attracted some attention, and in 1835 he received the appointment of Adjunct Professor of Chemistry and Lecturer on Botany in the Cincinnati Medical College. This institution subsequently gave him the degree of M. D. While at Cincinnati he published a "Synopsis of the Flora of the Western States," a 12mo pamphlet of 116 pages, enumerating the plants known to occur in the territory which "extends from the Alleghany mountains in West Virginia to the Platte river in Missouri Territory, and from the southern boundary line of Tennessee to the latitude of Detroit." This catalogue was in great part a compilation. The Kentucky plants were given almost entirely upon the authority of Dr. Short, those about St. Louis upon the authority of Dr. Lewis C.

Beck, who had contributed considerably to the knowledge of the plants of that vicinity through *Silliman's Journal*, while the collections of Nuttall were relied upon for the Missouri Territory. It enumerates over 1,800 species, and gives notes on habits of growth and localities. This catalogue was the first contribution of much importance devoted entirely to the Western flora. The following extract from the preface will explain the design of the work: "It has for several years been the author's design to publish a flora of the Western States when he shall have accumulated a sufficiency of materials; and he takes this opportunity of soliciting information from those who may choose to favor him with their correspondence, and of proposing an interchange of botanical specimens with all who may wish to form collections. The following catalogue, though necessarily incomplete, will probably aid in effecting the desired object, by exhibiting its present state of advancement, thereby enabling observers located in different sections of the assumed territory the more easily to make additions to it." The catalogue contains descriptions of thirteen new species of flowering plants, and two or three Charas. Of these, two stand in our manuals, *Solidago Ohioensis* and *Trillium nivale*. It also contains a description of *Solidago Riddellii*, so named by Dr. Joseph C. Frank, "a most zealous and accomplished botanist," author of "Rastadts Flora," and who was deputed by some German society to travel in this country and make botanical collections. Dr. Frank became intimate with Riddell, and spent some time with him in Cincinnati before he set out on his botanical journeys. During his stay in that city he interested himself in grasses and sedges, a work commemorated in *Eragrostis Frankii*. In 1835 Dr. Frank fell a victim to yellow fever in New Orleans.

In 1836 Dr. Riddell published a "Supplementary Catalogue of Ohio Plants," which contains descriptions of seven new species, of which four still stand,—*Linum sulcatum*, *Helianthus occidentalis*, *Scutellaria saxatalis* and *Stachys cordata*. That year he was elected to the chair of Chemistry in the Medical College of Louisiana at New Orleans, an institution which subsequently became the Medical Department of the University of Louisiana. This chair he occupied until his death. With his move to the South he seems to have given up his Western flora. He at once began to collect materials for a flora of the Southern States, however, a work which seems to have been constantly postponed on account of a multiplicity of other duties. His herbarium, upon which this work was to have been founded, is said to have been very large and excellently arranged. In 1851 Dr. Riddell con-

tributed to the Smithsonian Institution a manuscript on "The Plants of Louisiana." In this contribution he was aided by Prof. W. M. Carpenter and by Dr. Josiah Hale, who contributed the *Cypreaceæ* and *Gramineæ*. The Smithsonian did not publish the contribution, and Riddell made an abridgement of it under the title of "Catalogus Floræ Ludovicianæ" for the *New Orleans Medical and Surgical Journal*, which published it in 1852. The manuscript catalogue contained descriptions of new species by Prof. Carpenter, and twenty-one species and several varieties by Riddell. The manuscript or the subsequently printed catalogue seem not to have been consulted by Dr. Chapman in his Southern Flora, although *Dicliptera Halei*, one of Riddell's new species, is inserted.

While residing in New Orleans, Dr. Riddell was for some years connected with the government mint. He published in 1845 a "Monograph of the Dollar," a work containing fac simile impressions of between five and six hundred kinds of United States and Mexican dollars, both genuine and counterfeit. During the latter part of his life he did much work with the compound microscope, investigating extensively the lower forms of life, and inventing the binocular microscope. As early as 1836 he published in Cincinnati a paper on "Miasm and Contagion," in which he advocated that contagious diseases are caused by "organized and living corpuscles of various kinds." This contribution became popular, and was republished in Boston. He also contributed considerably to the scientific journals on matters relating to chemistry and other topics.

Dr. Riddell is said to have been a universal favorite with all who knew him. His students regarded him with adoration. He was a clear, concise lecturer, and a logical thinker. His business abilities were extraordinarily good, and he amassed a handsome property. His name is indelibly associated with botany through the genus *Riddellia*, a name which Nuttall gave to a western Composite. The original species, *R. tagetina*, has been supplemented more recently by *R. Cooperi* and *R. arachnoidea*, both added by Dr. Gray.—L. H. Bailey, Jr.

Notes on Some Ustilagineæ of the United States.

The study of the *Ustilagineæ* is beset with difficulties, for not only do the species themselves present comparatively few salient points of distinction, but the generic characters as estimated by recent writers depend largely upon the mode of germination of

the spores A perusal of the admirable paper of Woronin, *Beitrag zur Kenntniss der Ustilagineen*, shows how large a part the germination plays in the limitation of the genera, and when one bears in mind how little is known of the germination of our native species, he will understand how imperfect the classification of our *Ustilagineæ* must be. In the present article I would like to call attention to some of our little known forms, without pretending to regard my determination of the species as anything more than provisional, expecting that increased knowledge of the development, which it is to be hoped we shall soon have, will necessitate a reform in the nomenclature.

The genus *Entyloma*, founded by DeBary on *Protomyces microsporus*, Unger, includes a comparatively small number of species, in which the small mycelium inhabits the leaves of different herbaceous plants, and where the spores are formed in the continuity of the hyphæ, usually in large numbers, but do not become pulverulent as in most *Ustilagineæ*. The germination of the spores resembles that known in species of *Tilletia;* a short germinal tube is given off, at whose apex is borne a whorl of short cells which unite with one another in pairs. In some of the species of *Entyloma*, besides the spores in the interior of the leaves, there are conidia borne on stalks which penetrate the stomata in dense tufts and form white pulverulent spots on the leaves. Schrœter makes two divisions of the genus according as the species bear conidia or not. The spores of the greater number of species of this genus are very nearly alike in size and shape, being oval or somewhat angular, and in most cases it is not easy to define the species by the spores alone. The presence or absence of conidia, it seems to me, can hardly be regarded as constant in all cases, for, as in the form on *Ambrosia*, the conidia are sometimes present, but more frequently they are wanting. The conidia are usually like the forms referred to the genera *Fusidium*, *Cylindrospora* or *Ramularia* and, in the case of our species, it may be that the conidial forms have already been described as species of the genera above named, without reference to the spores in the interior of the leaves; but if such is the case I have been unable to trace them.

The type of the genus belonging to the division in which there are no conidia is *Ent. microsporum* (Unger), DeBary, which has been found by Prof. Arthur on *Ranunculus repens* near Chicago, but, although I have often searched for it, I have never found it near Cambridge. Another species found on *Ranunculus* in Europe, which has no conidia, *Ent. Ranunculi* (Bon.), I have never

found in this country, but a form found on *Thalictrum dioicum* in Wisconsin, by Prof. Wm. Trelease, is very nearly related to *Ent. Ranunculi*, although it would be going too far, at present, to call the two identical. The fungus on *Thalictrum* produces on the leaves rather small circular spots, which are at first yellow and later black. On the specimens which I have examined the conidia were not in very good condition, and it would be necessary to examine more mature specimens before expressing a decided opinion on the species. The conidia were in small patches on the under surface of the leaves, and the conidial-spores were linear, acute, 11-20 μ long by about 3 μ broad. The spores were abundant in the interior of the leaves, but hardly mature, and measured 9 12 μ in diameter.

The most common *Entyloma*, at least in the east, is one which occurs on *Compositæ*. Several years ago, when looking for the oospores of *Peronospora Halstedii* on *Ambrosia artemisiæfolia*, I repeatedly found bodies which were evidently not the desired oospores, although the *Peronospora* was growing on the leaves, but rather the spores of an *Entyloma*. Since then I have found specimens on *Ambrosia* with conidia as well as deep-seated spores, and what is evidently the same fungus was found in a luxuriant condition on *Aster puniceus* at Wood's Holl by Trelease. I have since repeatedly found the fungus on *Ambrosia* and *Aster* in small quantities, and it was abundant on *Aster puniceus*, growing at the top of Tuckerman's ravine on Mt. Washington, in September, 1882. On *Ambrosia* the fungus causes yellowish or grayish discolorations of indefinite shape, which become eventually black. On *Aster* the spots are more circumscribed and, although generally yellow, they sometimes have a purple border and the leaves become slightly thickened, which is not the case when it grows on *Ambrosia*. The conidia form farinaceous spots on the under surface of the leaves, which they sometimes almost cover. The determination of our species is doubtful. Several *Entylomata* are known on *Compositæ*. *Ent. Calendulæ* (Oudemans) and *Ent. Picridis*, Rostrup, of Europe, are said to be destitute of conidia and, if we accept the statement as absolute, our form must be different. The spores of our *Entyloma* average about 7.5-11.5 μ, while those of *Ent. Calendulæ* are often from 11-15 μ in diameter. Of *Ent. Picridis* I have examined only the specimen in Myc. Univ. No. 1815, in which the measurements more nearly resemble those of our own species. Of previously described American forms there is a *Protomyces polyspora*, Peck, in Myc. Univ. No. 1813, on *Ambrosia trifida* from New York. In my specimen there are no conidia nor are

any mentioned in the description. The species is an *Entyloma* rather than a *Protomyces*, as that genus is now limited. The spores are much like those of the form on *Ambrosia artemisiæfolia* and *Aster*, differing only in being somewhat darker and more angular, but the specimen of Peck was collected later in the season than any of my specimens. The conidial spores of my specimens are fusiform or slightly clavate, often somewhat curved, and measure 15-20 μ by 2-3 μ. They sometimes appear to be divided, but on this point I am not certain. I would propose the provisional name of *Entyloma Compositarum*, while awaiting further information with regard to the occurrence of conidia in the European *Ent. Picridis* and its relation to *Ent. Calendulæ*. I am inclined to believe that *Ent. Compositarum* may prove to be a more fully developed form of *Ent. polysporum* (Peck), the relationship of which to *Ent. Picridis* needs further study, for, although as distributed in Myc. Univ., the two have a different aspect, I am not so sure that one is not an earlier and the other a more mature form of the same species.

Besides *Ent. Compositarum*, I have examined three other species of the genus which are new to the United States. Prof. Bessey, to whom we owe so many interesting discoveries of *Ustilagineæ*, sent me an *Entyloma* collected in September, 1878, on leaves of *Solanum* or *Physalis* in Iowa, and later I received from Prof. Arthur the same fungus on *Physalis*, also from Iowa. In both cases there were abundant conidia and spores. The conidia are at first short but become long and filiform, measuring from 20-45 μ by 1.5-3 μ. Contrary to what is found in most species, the conidia on *Physalis* occur on both surfaces of the leaves in circumscribed round spots, which are at first pale but soon become black. The spores are yellowish or slightly brown when mature, generally globose, on an average 12-15 μ in diameter, and the surface, although sometimes smooth, is often slightly undulate. There is already a *Protomyces physalidis* Kalch. & Cooke, on *P. Hornemanni* from South Africa, described in *Grevillea*, vol. IX, p. 22, Sept., 1880. It may be that this is the same as the fungus from Iowa, but as no conidia are described in the African species, our species may be called provisionally *Entyloma Besseyi*.

Two other species have abundant conidia as well as spores. One was discovered on the leaves of *Menispermum Canadense*, in Wisconsin, by Prof. Trelease, in August, 1881, and the other on *Lobelia inflata* was collected by me at Gilead, Maine, in September, 1882. As far as I can ascertain, both species are undescribed, although in the case of the one on *Menispermum*, it seems

hardly probable that the striking conidia could have escaped the notice of earlier collectors. *Entyloma Menispermi* produces dark, ill-defined discolorations on the upper surface of the leaves, which are not thickened by the presence of the fungus. The conidia form conspicuous, farinaceous, polygonal patches on the under surface of the leaves, which they sometimes nearly cover. The conidial stalks are more loosely branched than in the previously mentioned species and the conidial spores are stouter and pointed at one end, measuring 11-24 μ by 3.5-4 μ. The spores are globose and smooth with thin walls, about 5.5-11 μ in diameter.

Entyloma Lobeliæ produces no marked distortions of the leaves, but the plants infested have a whitish color, looking as if they were attacked by some member of the *Perisporiaceæ*. Ill defined yellowish spots are formed on the upper side of the leaves, and gradually the whole leaf blackens and shrivels. The conidia, although very abundant on the under side of the leaves, are not so distinctly characterized under the microscope as those of the last species. They are narrowly fusiform and measure 10-25 μ by 2-3 μ. The spores are larger than in *Ent. Menispermi*, but smaller and decidedly more delicate than in *Ent. Besseyi*.

The species above mentioned may be summarized as follows:

A. *Species destitute of conidia.*

1. Ent. Microsporum (Ung.) DeBary.
On *Ranunculus repens*. Near Chicago. Prof. J. C. Arthur.
2. Ent. Polysporum (Peck).
On *Ambrosia trifida*. New York.
3. Ent. Linariæ (Schrt.)
On *Veronica peregrina*. Wisconsin. Trelease.

B. *Species with conidia.*

4. Ent. Compositarum Farlow ad int.
Conidia fusiform or slightly clavate, often curved, 15-20 u long by 2-3 u broad. Spores globose or somewhat angular, about 7.5-11.5 u in diameter, wall thin and nearly colorless.
On *Aster puniceus* and *Ambrosia artemisiæfolia*. New England.
5. Ent. Besseyi Farlow ad int.
Conidia rod-shaped, becoming filiform, 20-45 u long by 1.5-3 u broad. Spores globose, 7.5-15.5 u in diameter, average 12-15 u, yellowish brown, thick walled, surface smooth or undulate.
On *Physalis*. Iowa. Profs. Bessey and Arthur.
6. Ent. Menispermi Farlow and Trelease.
Conidia acutely ovate, 11-24 u by 3.5-4 u. Spores light colored, globose or somewhat angular, smooth, with thin walls, about 5.5-11 u in diameter.
On *Menispermum Canadense*. Wisconsin. Prof. Trelease.
7. Ent. Lobelliæ Farlow.
Conidia narrowly fusiform, 10-25 u by 2-3 u. Spores light-colored, globose or slightly angular, thin-walled, 8-15 u in diameter, average 7.5-11.5 u.
On *Lobelia inflata*. Gilead, Maine.
?8. Ent. Ranunculi (Bon.)
forma *Thalictri*.
On *Thalictrum dioicum*. Wisconsin. Trelease.

In connection with the species of *Entyloma* previously mentioned, I would add that *Protomyces Sagittariæ*, Fuckel, a species whose systematic position is not well known, was found by me growing on *Sagittaria variabilis*, Engelm., at Newton, Mass., in the month of October. I am indebted to Prof. DeBary for an authentic specimen of Fuckel. I received from Mr. J. Fletcher, of Ottawa, some fruit of *Potamogeton Vaseyi*, Robbins, attacked by a very curious fungus. The specimens had been preserved in alcohol and consequently there was no possibility of making the spores germinate. The fruit of the *Potamogeton* was swollen and a section showed globular masses scattered through the substance of the fruit. The masses consisted of densely packed cells, the outer layer of which was darker colored than the rest and regularly arranged, so that the cells, which had the shape of short cylinders with rounded ends, had their longer axis always in the direction of the radius. Beneath this regularly arranged layer the cells were roundish-angular and presented the appearance of parenchymatous cells. Having but little material at my disposal I was unable to study the fungus at all satisfactorily, but it appeared to me to be probably one of the *Ustilagineæ*, related perhaps to *Sorosporium* or *Thecaphora*. My friend, Dr. Maxime Cornu, of Paris, has expressed the opinion that the fungus in question belongs to a genus recently described by him under the name of *Doassansia*. As the description of the genus has not yet reached this country, I can give no further information, but would call the attention of collectors of *Potamogeton* to the existence of this curious fungus of which more material is much needed. The fungus occurs also on *P. pusillus*, *P. perfoliatus*, var. *lanceolatus*, and *P. natans*, according to Mr. Fletcher, whose description of the diseased fruit, when freshly gathered, I quote for the benefit of collectors of aquatic plants:

"The fruit was swelled out to more than four times its proper size and was almost globular, of a greenish white color, spotted with reddish-brown—later these fruits cracked and then the whole soon decayed and a white mouldy growth was developed."

While collecting in King's ravine in the White mountains, in August, 1882, I found a curious fungus on *Epilobium alpinum* growing on the borders of the torrent which falls from Mt. Adams to the floor of the ravine. The *Epilobium* was infested with *Æcidium Epilobii*, D. C., and on some of the leaves were dark-colored spots which I, at the time, supposed to belong to *Puccinia Epilobii*, D. C. A microscopic examination showed that the fungus was one of the *Ustilagineæ* and very closely re-

lated to *Doassansia Alismatis*, Cornu, for an authentic specimen of which I am indebted to the author of the species. The fungus appears to the naked eye in the form of blackish convex nodules about the size of a pin's head, which are collected in groups, especially at the apex of the leaves, and visible on both sides of the leaves. The nodules consist of densely packed roundish-angular spores, those on the outside being dark colored and those within lighter colored. The masses are surrounded by a fine mycelium, but the development of the spores and their germination could not be studied from the material which I collected and, owing to the remoteness of the locality, it will be difficult for future collectors to find the spot where my specimens were collected. It is not impossible that the fungus has been described by some older writer, but I have not been able to find any trace of it. To mark the species it may be named temporarily *Doassansia Epilobii*.

Doassansia Epilobii Farlow ad int. Spores densely packed in globular or lobulated masses which are 80-200 μ in diameter. Spores irregularly polyedral, approaching globular, 7.5-17 μ in diameter, average 10-12; external spores blackish-brown, thick-walled, outer surface cuticularized; internal spores lighter colored with thinner walls.

Thecaphora aterrima, Tul., was found several years ago by Prof. Bessey, on *Carex*, in Iowa. Collectors should search for this interesting species in the Eastern States. *Ustilago Sorghi* (Lk.) has been received from Dr. Taylor, of the Agricultural Department in Washington, where it was found growing on cane grown from seed imported from China, and it has also been found by Prof. Trelease, on amber-cane in Wisconsin. *Ustilago Gynerii.*, Vize, of which I have examined specimens presented to me by Dr. Harkness, is the same as *Gymnosporium Arundinis*, Corda, and is to be excluded from *Ustilagineæ*. *Tilletia striæformis*, West. (*Till. DeBaryana*) was found by Mr. B. D. Halsted on an unknown grass at Passaic, N. J., and by Mr. A. B. Seymour at Granville, Mass. A curious form has been found by Prof. Bessey on leaves of *Polygonum* (*P. Pennsylvanicum?*), at Ames, Iowa. The fungus forms purple spots on the leaves, and the spores are borne in projecting pustules nearly black in color and hard instead of pulverulent. The flowers are also affected by what seems to be the same fungus, and I have received from Mr. Halsted flowers similarly affected, from New Jersey, but he did not find the fungus on the leaves. The formation of the spores shows that the fungus is an *Ustilago*, and regarding the

fungus on the leaves alone, it would appear to be the *Tilletia bullata* of Fuckel, referred by Schroeter in Cohn's *Beit. zur Biol.*, vol. II, p. 355, to *Ust. Bistortarum* (D. C.). Prof. Bessey's specimens on leaves agree well with Schroeter's description. A question may arise as to the species when we consider its appearance on the flowers. In *Ust. Candollei*, Tul., closely related to *Ust. Bistortarum*, the ovaries are distorted so that they project like columns from the perianth, but in the specimens collected both by Prof. Bessey and Mr. Halsted, the distortion is still greater. The ovaries are all transformed into more or less globular hard masses and, as nearly all the flowers of a spike are affected, the masses coalesce, forming a compact cylinder with a nodulated surface in which the individual flowers can hardly be recognized. The color of the spores, both in the form on the flowers as well as that on the leaves, is hardly purple but more nearly brownish than in *Ust. Candollei*. While referring the species to *Ust. Bistortarum* (D. C.), it will be seen that there are several points in which the American plant does not exactly agree with the European form. The form on the leaves, I would add, is much like Libert Plant. Crypt. Ard., No. 88.

W. G. FARLOW.

"Thistledown."[1]

A STUDY.

As a child, have you not held gently poised twixt thumb and finger the airy, fleecy thistledown, then lightly blowing watched the tiny parachute as it sailed away? It is a delicate, cunning device, lighter and more buoyant than a bird's feather, smaller and finer than the moth's antennæ.

When separated from the achene, it consists of plumelike filaments attached to a ring. Its mode of attachment to the seed is peculiar. The upper end of the achene is grooved, thus leaving a small projecting edge of the calyx. Into this groove fits a minute ring—large enough to slip upon a common pin. The pappus is attached to the lower edge of this ring, while over the upper edge fits the corolla and its adhering stamens. The end of the achene—inside the groove—is elongated and to this is attached the pistil.

[1] From the "*Aurora*" for May, a journal conducted by the students of the Iowa Agricultural College. Miss Knapp is a special student in botany, and in this article gives us a glimpse of the kind of work done by Professor Bessey's pupils.—EDS.

Microscopically each filament consists of eight or ten rows of very long parallel cells. On the margins are seen the outward pointed tips of newly developing cells.

A fully grown pappus measures about 25 m. m.; that of a head not yet opened about one-half this length, while one partly opened is three-fourths.

Is the mode of growth by multiplication or by the elongation of the cells? It must be by elongation, for, on measuring the cells of the unopened head, they are found to be only one-half as long as those of the fully grown pappus. The cells of the latter are about one thirty-sixth of an inch or of the entire length.

Besides the change in the cells of the main portion, the marginal ones, which in the very young heads appear as barbs, become greatly lengthened and thus give the plumose or feathery appearance to the pappus

But this elongation is not the only thing that takes place in its development. Each filament, by some action, bends backward until the pappus stands in all directions around the achene.

In order to determine the manner of this action I tried the following simple experiments:

I put on the stove an achene which had not yet fully opened, and therefore had the pappus still adhering. After a moment the pappus began to separate and curve back, the movement showing particularly at the base where it joins the little ring, the marginal cells, also separated, standing out like the vanes of a feather. The whole took about one-half minute, the movements being quick and rather jerking.

Taking the same specimen in which the pappus was now all bent over the achene, I applied a small hair brush, wet in water, to the top of the achene so that the basal cells would be moistened first. These cells began to draw closer to the ring, slowly bringing the pappus from its recumbent position.

Again, upon moistening a piece of dried pappus with alcohol and potash, the marginal cells drew quickly toward the main portion.

Afterwards, in studying specimens of *Mulgedium* and *Lactuca*, I found that the pappus was joined to the achene by two or three rows of small square cells.

From these facts it would seem evident that the lower surface is more susceptible to heat or moisture, contracting in the presence of the latter, and swelling again in the presence of the former; but mainly this movement is due to the small square cells, for by their contraction the pappus moves downward.

On account of this Prof. Bessey proposes for them collectively the name "Carpus," and individually that of "Carpallary cells," because the relation they bear functionally to the pappus is so nearly like that of the carpus to the phalanges.

I would also suggest that the little ring spoken of is a portion of the calyx, for all the species of *Lactuca* examined have a beak or projection to the calyx. This is wanting in the Thistle, or rather has been reduced to a rudimentary form in the shape of this minute ring.

The "Thistledown" or pappus treated of in this article is simply that of *Cnicus altissimus*—our common purple thistle; but its form is characteristic of the genus *Cnicus*. Formerly thistles were placed under *Cirsium*, and *Cnicus* was called a subgenus, but Bentham and Hooker, in their "Genera Plantarum" have made two distinct genera, taking the different forms of pappus as the ground of distinction. *Cirsium* contains those thistles having barbed pappus, or like the early stage which I have described, while *Cnicus*, or the true thistles, have plumose pappus. —MINNIE KNAPP, Ames, Iowa.

GENERAL NOTES.

The Fig and the Caprifig.—The relation existing between the wild and cultivated figs has long been a puzzle, and has been variously explained. Graf Solms considers them as two races under one species. Gasparrini describes them as distinct genera. Fritz Müller thinks they are simply male and female plants, and to this view botanists are inclining. The fact that the presence of the caprifig was needed for the best development of the fig, and that the former was inhabited by an insect which visited the latter if possible, has long been known. The operations of this insect are very interesting, and are given in *Nature*, by W. B. Hemsley, as follows:

"The insect that operates in this manner is a small hymenopter, the complete annual cycle of development of which takes place within the three crops of fruit of the caprifig, whilst only one generation visits the fig, and that, as will be seen, to no advantage to the insect itself. In order to render what follows easily understood, we will give the present Neapolitan names of the three crops of the caprifig. The fruits that hang through the winter and ripen in April are called *mamme*. These are followed by the *profichi*, which ripen in June, and the *mammoni*, which ripen in August and September. If we closely examine the *profichi* when fully ripe in June, we see here and there a black-winged insect emerging from the orifice at the top, its hairy body dusted over with pollen grains that have adhered to it in its passage through the zone of male flowers. And if we cut open one of these fruits, we find a considerable number of

these insects, all striving to find the way out. These are females, and associated with them are some helpless wingless males, and very often a number of a slender ichneumon as well. The female of this generation visits not only the *mammoni*, but also the fruits of the fig, if there are any at hand, in order to deposit her eggs. Now, the remarkable fact in connection with this, is that she is able to do so effectually in the *mammoni*, but not in the edible fig, though she succeeds in penetrating the fruit far enough to convey pollen to the female flowers, perishing in the act. Furthermore, the generation of the insect that develops in the *mammoni* deposits eggs in the *mamme*, and the generation proceeding therefrom finds an asylum for its progeny in the *profichi*."

Prof. Solms says that the eggs must be deposited within the integuments of the ovule itself, or they will not develop. The ovipositor is thrust between the branches of the stigma, down the pollen channel of the style into the ovary, and into the solitary ovule itself.

Classification of Plants.—Mr. Lester F. Ward, in a recent lecture at the National Museum in Washington, proposed the following scheme of classification, which he claims is the nearest approach yet made to a natural system, and upholds it mostly upon paleontological grounds:

- Cryptogams
  - Cellular.
  - Vascular
    - Filicineæ
      - Filices.
      - Rhizocarpeæ.
    - Lepidophytæ
      - Equisetineæ.
      - Lycopodineæ.
      - Ligulatæ.
- Phenogams
  - Gymnosperms
    - Cycadaceæ.
    - Coniferæ.
    - Gnetaceæ.
  - Angiosperms
    - Monocotyledons.
    - Dicotyledons
      - Apetalæ.
      - Polypetalæ.
      - Gamopetalæ.

The Effects of Moisture on Pine.[1]—Ten pieces one inch square by ten long were selected from a piece of pattern pine that had been "in the dry" for six or seven years. Inasmuch as this is the driest class of commercial pine, the results are more satisfactory and conclusive. The pieces were numbered consecutively, and two were taken for each experiment to obtain a mean result, and avoid error as much as possible. Nos. 1 and 2 were placed in a drying oven in the chemical laboratory, and kept at a temperature of 100° C. Nos. 3 and 4 were placed in moist air; and Nos. 5 and 6 immersed in water. Nos. 7 and 8 were exposed to the ordinary atmospheric changes. Nos. 9 and 10 were made into shavings, and placed in the oven for perfect drying. Each piece was carefully weighed and measured once in twenty-four hours. (Experiment lasted 14 days). The average weight of each piece at the beginning of the experiment was 63 grams, or 6.3 grams per cubic inch. The tabulated results show: I. That there was a marked difference in the weight of some of the pieces, those being heavier that were situated near the center of the tree. II.

[1]Abstract of a paper read before the Scientific Society of Purdue University, by Philip S. Fitzgerald, class of '85.

that the dried blocks (1 and 2) had lost 9.5 % of their original weight. III. That the moist air blocks (3 and 4) had gained 3.9 % in weight. IV. That the wet pieces (5 and 6) had absorbed 62.25 % of their own weight of water. V. That the ordinary air pieces (7 and 8) had undergone practically no change. VI. That the shavings (9 and 10) had lost only 7.9 %, or less than the blocks 1 and 2. VII. That the increase and decrease in width was very much more marked in the direction of the annual rings than in the direction of the medullary rays. VIII. That the greatest increase in width was $\frac{1}{40}$ of an inch, which was from *fifty to sixty times greater* than the increase in length; and IX. That the increase in size was not proportional to the gain in weight.

Rhododendron (Azalea) Vaseyi, Gray in Proc. Am. Acad., xv, 48. 1879.—Having been favored with notes upon the living plants and both flowering and fruiting specimens of this interesting shrub, from my obliging friends Mr. Canby and Mr. J. Donnell Smith—the latter sending abundant specimens both of this year's blossoms and of last year's fruiting—I propose to amend the published character, which was drawn up from young Mr. Vasey's original specimens.

First, as to the flower buds. I described these as with "*perulis paucis*," but summer specimens with formed flower buds for the next year have well imbricated bud-scales. The outer and shorter bracts fall as the bud opens, the thin innermost remaining longer, which led to the mistake. Maximowicz makes a similar mistake in respect to *R. Rhodora*.

Next, the blossoming is precocious rather than coëtaneous with the leafing. Vasey's specimens, with flowers ready to fall, have leaves an inch and a half long. Those sent by Mr. Smith, which were gathered at the middle of May by Mr. S. Kelsey, are either leafless, or the more advanced plants just developing a pair of leafy branches from just under the flowering bud.

In the third place, the corolla is irregular in a bilabiate way, thus confirming its relationship to *R. Rhodora*, however different in habit. Maximowicz takes notice of this bilabiation in two N. E. Asiatic species. It is 5-parted or nearly, but the lateral sinuses are deeper, and three of the divisions more connected than the other two. Mr. Canby notes that the three divisions of what may be called one lip, are shorter than the other two, and so it is in a corolla received from him; but in numerous dried specimens this is not so apparent. But the *spread* of the divisions is decidedly irregular, three seemingly ascending and two recurved-spreading. The upper corolla-lobes are more or less spotted inside toward the base; in some flowers the spots are dark and conspicuous.

In the fourth place, the stamens are prevailingly seven, quite unequal, three or four of them larger and with stouter filaments. I had described them as five, and this is true of some flowers. In one flower I find only four, three large and one depauperate. The ovary is beset with stipitate viscid glands. I had described the capsule as glabrate (not glabrous), which is not far out, but it is roughish with the vestiges of the bristly glands. Mature leaves are from obovate-oblong to oblong-lanceolate, acute or acuminate at both ends, the larger four to six inches long. A. GRAY.

Notes from California.—1. The rare *Streptanthus heterophyllus* ranges from Temecula Cañon to San Rafael, Mexico.

2. There are all sorts of transitions between *Lepidium Menziesii* and *L. lasiocarpum*, and as Watson has united *lasiocarpum* and *Wrightii*, it is probable that this will follow. The number of stamens varies from two to four in each, while the flattened pedicels vanish, and the pods are smooth or pubescent.

3. *Lepidium nitidum* ranges throughout S. California and N. Mexico. The seeds hang from the base of the style.

4. *L. dictyotum* and the var. *acutidens* occur on the Tamecula plains, and the latter also at San Diego. The typical form has been supposed before to be confined to central Nevada, and the variety was not known from S. California.

5. I have three forms of *Thysanocarpus curvipes; a.* Leaves runcinate, stamens conspicuously exserted, petals not surpassing the sepals, auricles short or almost none, pods rounded. *b.* Leaves lyrate, auricles long, pods obtusely pointed, stamens and petals as in *a. c.* Stamens short, petals surpassing the sepals, leaves lyrate. All these forms have the peculiar hairs of *T. curvipes.*

6. *Thalictrum Fendleri* grows in Temecula Cañon.

7. A peculiar form of *Clematis ligusticifolia* abounds north of San Francisco, having both perfect anthers and sterile filaments on the pistillate plant, thus making it perfect. The leaves differ somewhat also, but Mr. Watson regards it as *C. ligusticifolia.*

8. *Viola pedunculata* ranges throughout S. California into Mexico as far as Eucenada.

9. *Rhamnus croceus* varies much. The stamens are oval to oblong; calyx lobes lanceolate, acute; petals sometimes wanting.

10. The horns of *Ceanothus crassifolia* are broadly ovate and very short, while those of *C. cuneatus* are often linear.

11. The petals of *Cneoridium dumosum* are four times as long as the calyx. This hitherto rare plant, along with *Adolphia Californica*, one equally rare, ranges south along the coast to Eucenada, Mexico. The latter is much more common further south.

12. *Astragalus tener* is now to be found in S. California at Soledad, near San Diego.

13. The coast plant *Boykinia occidentalis* is not uncommon in the Sierras at Emigrant Gap.

14. *Psoralea physodes* is abundant in the mountains at Los Angeles.

15. *Hosackia decumbens*, var. *Nevadensis*, is not annual and has no claim to exist as a variety, as the characters given do not hold good.

16. *Hosackia maritima* is either pubescent or smooth, and even fleshy, and extends far into Lower California.

17. The leaflets of *Vicia Americana*, var. *truncata*, are often deeply emarginate.

18. *Sambucus bipinnatifida* ranges south at least to Eucenada, Mexico.

MARCUS E. JONES, *Salt Lake City.*

Galinsoga parviflora, a nettle-like Composite from S. America, is abundant and fully established along the streets and in neglected gardens near Union Park, in Chicago.—J. C. A.

Notelets.—It is well known that the milkweeds (*Asclepias*) often catch insects in their flowers. In the Botanic Garden at Cambridge I have frequently seen small moths hanging by their proboscides to certain foreign Asclepiads. The other day I found our common little red butterfly (*Lycæna Americana*, Harris) entangled in the same way by the flowers *Asclepias Cornuti*, Decaisne.

The same day I was attracted to two fine specimens of the *Argynnis* butterfly on one of the swamp thistles. I wondered why they were so quiet. Examination revealed a spider of almost the exact colors of the involucral scales. He had already sucked dry one specimen and was at work on the other.

I have frequently, in New Brunswick, observed gigantic *single* specimens of *Habenaria fimbriata*, R. Br. It remained for Rhode Island to show me a group of a dozen or more of these elegant plants together. I found them, a few days since, near Buttonwoods, Warwick, R. I., growing in a deep, woody hollow, near a stream. It was a sight to always remember.—W. Whitman Bailey.

Sarcodes sanguinea.—The *Gardeners' Monthly* contains the following on the Snow Plant (*Sarcodes sanguinea*), by Thomas Meehan, "as the result of many examinations, to be an annual, germinating on small pine roots and subsequently obtaining subsistence from the earth, as do *Aphyllon* and *Epiphegus*."

I very much doubt the correctness of this statement, and as truth should be the object of all investigation, I give the result of some of my observations, made during a residence of seventeen years in the home of *Sarcodes*, and invite farther inquiry from those who are interested.

My attention was first called to the peculiar growth of *Sarcodes* as early as 1865, by a plant brought me by a brother, who was working in a hydraulic mine at the time (he had piped it out). The under-ground stem measured three feet, and a part was broken off. It is a common saying among the miners that "the roots of the 'Snow Plant' have no end."

During the years 1875 and 1876 my attention was more particularly given to the growth of *Sarcodes*, to ascertain if it was really a parasitic plant, and from what roots it drew its nourishment.

The under-ground stem is covered with thick, fleshy leaves (or scales), and in the axil of each leaf is an undeveloped flower bud. The stem, in the smaller plants, extends down only a few inches, while in the larger ones it reaches a depth of three feet or more. The root consists of a coralline mass, which contains from one to more than one hundred cubic inches, according to size and age of the plant. The descending axis is attached to this mass by short, brittle roots, about one inch in length.

I have dug dozens of these plants, and at all seasons of the year. Always found the coralline mass greatest about the time they began to appear above the ground in early spring. It is gradually absorbed in growing, leaving a honey-combed appearance in the soil. When the growth for the season is completed, there only remains about one cubic inch of the mass, and just *below* and a little to one side of the old under-ground stem, and attached to the mass of root, is a little "snow plant."

In the spring of 1878, I marked the place of growth of a number of these plants, as I had promised roots of them to Mr. Elwees, of England, and friends

in the East, who wished to try to grow them. I dug some of these plants in November, after the rains had commenced, and discovered that the root mass and little plantlet had greatly increased in size. I dug some of the staked plants early in March, and found them still progressing in growth, and others that were not dug came up and bloomed by the stakes.

My conclusions are, that *Sarcodes* is an herbaceous perennial, continuing through many years, and, by the little plantlet *always* being found *below* the older one, that it descends a little deeper into the earth each season, and this accounts for the great depth to which some of the under-ground stems penetrate.

As to the germination and infant life of *Sarcodes* I know nothing, but am satisfied that they receive their nourishment from the earth after they attain any considerable size.—MRS. R. M. AUSTIN.

New Indiana Plants.—Four species have just been added to the list of known Indiana plants, viz: *Asclepias phytolaccoides*, growing abundantly in the college grounds at Wabash College, Crawfordsville; *Habenaria orbiculata*, Avilla, Ind.; *Epilobium augustifolium;* and *Sambucus pubens*.

EDITORIAL NOTES.

PROF. BUREAU has been appointed Director of the *Jardin des Plantes* in place of the late M. Decaisne.

PROF. LUCIEN M. UNDERWOOD has been elected Professor of Geology, Zoölogy, and Botany in Syracuse University.

THE DEPARTMENT OF AGRICULTURE report for 1881–2, contains some interesting matter pertaining to bacterial subjects, illustrated with several colored and uncolored plates.

THOMAS J. HOWELL, in *Pop. Sci. Monthly*, shows that N. Am. plants can be divided into three or four distinct floras, corresponding to the different geological formations they inhabit.

EXTENSIVE PREPARATIONS are being made by the Chicago scientific public for the American Association of Microscopists, which holds its annual meeting in that city from August 7 to 10. A large attendance is anticipated.

THE LIBRARY OF PROF. J. DECAISNE, probably one of the finest in Botany, Horticulture and general Natural History sold since Jussieu's time, was sold in Paris last month. The catalogue, containing a portrait of Decaisne, and a biography by Bornet, covered 480 pages.

IT IS TO BE HOPED that there will be a large attendance of botanists at the A. A. A. S. meeting at Minneapolis, beginning August 15th. No better place for botanists could have been selected, and every moment can be made pleasant, not only in exploring new ground, but in that congenial companionship which the western worker, particularly, is denied during the greater part of the year. The biological section under Prof. Beal ought to be of great interest, and botanists should make a strong rally to its support.

THE TORREY BULLETIN'S "Contributions toward a list of the State and Local Floras of the U. S.," appears with its fourth part in the number for June, being devoted to the "Southern States." Kentucky is credited with 11 lists, Tennessee with 1, Alabama 1, Mississippi 1, Louisiana 3, Arkansas 2, Texas 5.

DR. HERMANN MULLER concludes that the flowers of *Pulmonaria officinalis* change from red to blue, as they grow older, in order to indicate to the intelligent bees (*Anthophora pilipes*, F.) which fertilize it, which flowers should be visited by them for their own and the plant's profit. One bee which he watched visited 182 red to 10 blue ones.

COL. R. H. BEDDOME has just published a hand-book of Indian ferns. It covers the same area as that included in Hooker's "Flora of British India," and includes 25 per cent. of all the known ferns. It is the first attempt to study Indian ferns in the field, and the result is most satisfactory, the species numbering 661, grouped under 98 genera. There are 300 illustrations.

P. C. SMITH, ESQ., of Circleville, Ohio, gives in the *Pop. Sci. Monthly* some strong evidence in favor of the idea that the rings of growth in trees are annual rings. The evidence relates principally to oaks, and is based upon the "hacks" made by old government surveyors of known date. A counting of rings from the "hacks" out corresponds in every case to the number of years known to have elapsed.

IN HACKEL'S recent monograph of the European *Festucæ* there is very careful and minute work in the grouping of forms. For instance, *F. ovina* has 9 sub-species, the first sub-species (*Eu-ovina* by name) has 8 varieties with names, the var. *vulgaris* having 5 named sub-varieties, the var. *duriuscula* 7, etc. *F. rubra* has 6 sub-species, some of which have seven varieties, and some of these as many sub-varieties.

PROF. W. C. WILLIAMSON ADDUCES (vide articles in journals) additional evidence confirmatory of Prof. A. Dickson's interpretation of the morphology of the pitchers of *Cephalotus follicularis*. His testimony seems to leave little room for doubt that the petiole of the true leaf is identical with the petiole of the pitcher, which is formed by the pouching of the leaf blade and covered by the lid, an outgrowth from the upper surface of the blade.

IN AN INTERESTING note in *Science*, Prof. N. S. Shaler discusses the function of the "knees" of the swamp cypress (*Taxodium distichum*). He concurs with the common explanation that they permit the access of air to the roots. He also considers that we have in it the case of the survival of a species owing to a peculiar habit of growth. These cypresses, when grown upon dry ground, develop no such thing as "knees," but when driven to the water these begin to develop. In this way a "peculiar organ is developed for a special purpose," and, crowded from the dry ground by the broad-leaved trees, it has sought and found safety in the swamps.

WINTER HAS some interesting notes in the May *Hedwigia* on N. American fungi. He considers *Æcidium hemisphærium* Peck on *Mulgedium*, to belong to *Puccinia Prenanthis;* and the teleutospores of a *Puccinia*, found by A. B. Seymour in Illinois, on *Lophanthus nepetoides*, he refers to *P. verrucosa*. What is un-

doubtedly the latter species was found by the writer near Chicago a few days since on *L. scrophulariæfolius*. He also advocates keeping the *Æcidium* on *Ranunculus abortivus* (*Æ. Ranunculi* Schw.) as a species separate from *Æ. Ranunculacearum* DC., which is common to many *Ranunculaceæ*, and suggests that it may belong to some *Uromyces* on a monocotyledonous host.

CURRENT LITERATURE.

Supplement to the Catalogue of the Davenport Herbarium.—This brings the Fern Catalogue up to March, 1883, and contains valuable notes on various species, by Mr. George E. Davenport. Mr. Davenport also publishes a very neat and convenient Check List of N. A. Ferns, including 32 genera, 161 species, and 24 varieties.

Botanische Mikrochemie, by V. A. Poulsen, translated from the Danish by Carl Müller. pp. XVI, 83. Cassel: Theodor Fischer.—The publication by Mr. Penhallow of his "Vegetable Histology" recalls a little book by the above title, which, though published more than a year ago, has not received the attention in this country which it deserves. To every reader of German it will commend itself at once, and its German is so easily read that even a student with but a cursory knowledge of the language will find little difficulty in picking out from it much that is useful. The first part of the book is devoted to "The Microchemical Reagents and their Use." Under this head fifty reagents are named. The manner of using each and the reactions for which they are used are clearly and briefly stated. To this part is appended a few pages treating of preservative media and cements. The second part enumerates "The Plant-substances and the Method of their Detection." Forty-one substances are given, together with the reagents and methods to be used for their detection. Altogether, a more useful little book could hardly be found. It should be in every laboratory and on every working table. It is much to be hoped that some one may soon obtain the right of translating it into English, that its usefulness to English and American students may be enhanced. It is to be regretted that the only similar book in English, Penhallow's "Vegetable Histology," was so marred by the publisher, in order that it might minister to his pride in heavy paper and wide margins. Notwithstanding the fact that Poulsen's book contains twice as many pages and nearly three times as much matter, it can be sold for 3 marks instead of $1.20. The book is an inch and a half narrower and two and a half shorter than Penhallow's, and yet the printed page is larger. Moreover it is bound as a hand-book should be, so that it will lie open at any page. We hope Mr. Penhallow will see to it that when a second edition of his book comes out it shall not sacrifice usefulness to looks.

On the Relations of Micro-Organisms to Disease, by Dr. W. T. Belfield, of Rush Medical College. Chicago, 1883. 12o., 131 pp. Illust.

Bacteria and the Germ Theory of Disease, by Dr. H. Gradle, of the Chicago Medical College. Chicago, 1883. 8o., 219 pp.

These works treat the subject in a comprehensive, careful and judicious manner. They have the merit of presenting the great mass of information on the subject, which is largely the work of foreign biologists, and consequently published in foreign languages, in a well digested and readable form. While primarily addressed to the medical fraternity, they are equally intelligible and instructive to all who are interested in the *rôle* of bacteria or the etiology of disease. As the works have a pathological aim, they contain no characterization of species or systematic classification. Much attention is deservedly given to methods of manipulation and the trustworthiness of observers. References to authors and their works are ample, thus facilitating the consultation of the

original sources of information, if one desires to form an independent judgment. The first mentioned work contains eighteen excellent cuts from photomicrographs, partly original, and all new to American readers; it also has an appendix, giving methods of staining and manipulation for the detection and study of bacteria. The second work is to be commended for the very full table of contents and index.

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BAKER, J. G.—Synopsis of the Genus Selaginella (continued from p. 145) (2 new species), *Jour. Bot.* 21. 210.

BEDDOME, COL. R. H.—Review of his "Hand-book to the Ferns of India," by J. G. Baker, *Nature*, 28. 146.

BROWN, J.—Leaves and their Environment, *Nature*, 28. 55.

DAVENPORT, GEO. E.—A new Fern (Cheilanthes Pringlei, from S. E. Ariz.), with plate, *Torr. Bull.* 10. 61.

DINGLER, H.—Contributions to the Oriental Flora, II. *Flora*, May 11.

DOWSON, S. S.—Ground Ivy, *Nature*, 28. 126.

ELLIS, J. B.—Notes on the Study of Fungi, *Am. Nat.* 17. 782.

FEHLNER.—Leskea (?) Heldreichii Fehlner n. sp. (with plate), *Flora*, May 21.

FISCHER, DR. ALFRED.—Investigations upon the Parasites of the Saprolegniæ, reviewed by Büsgen, *Bot. Zeit.* May 18.

FITZGERALD, R. D.—New Australian Orchids (4 species), *Jour. Bot.* 81. 203.

GARDNER, J. S.—Reply to Nathorst on Fossil Algæ, *Nature*, 28. 52.

GODLEWSKI, C.—Contributions to a Knowledge of the Respiration of Plants, reviewed by W. Detmer, *Bot. Zeit.* June 1.

GOEPPERT and MENGE.—Review of their "Amber Flora," by J. Starkie Gardner, *Nature*, 28. 152.

GOETHE, R.—The Injuries of Frost to Fruit Trees and their Prevention, reviewed by Paul Soraner, *Bot. Zeit.* June 8.

HANCE, H. F.—Three new Chinese Begonias, *Jour. Bot.* 21. 202.

HICK, THOMAS.—Notes on Ranunculus Ficaria, *Jour. Bot.* 21. 198.

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LAYARD, E. L.—The Sacred Tree of Kum-Bum, *Nature*, 28. 79.

MEYER, A.—Contributions to the Knowledge of Important Pharmaceutical Plants, reviewed, *Bot. Zeit.* June 15.

MOELLER, J.—Anatomy of the Bark of Trees, reviewed by Loew, *Bot. Zeit.* June 8.

MUELLER, F. V.—Plurality of Cotyledons in the Genus Persoonia, reviewed by Peter, *Bot. Zeit.* June 1.

MUELLER, HERMANN.—Effect of the change of color in flowers of Pulmonaria officinalis upon its fertilizers, *Nature*, 28. 81.

MUELLER, DR. J.—Lichenographical Contributions, XVIII. *Flora*, June 1.

NATHORST, A. G.—Fossil Algæ, *Nature*, 28. 52.

NORDENSKIÖLD, A. E.—The Scientific Results of the Vega Expedition, reviewed by E. Koehne, *Bot. Zeit.* June 22.

PAX, DR. FERD.—Flora of the Rehhorn near Schatzlar (continued), *Flora*, May 11.

PECK, CHAS. H.—A new Fern Rust (on Cheilanthes Pringlei), *Torr. Bull.* 10. 61.

PLOWRIGHT, C. B.—Classification of Uredines (giving the British species), *Grev.*

PROGEL, DR. A.—Flora of the District of Waldmünchen, reviewed by Peter, *Bot. Zeit.* June 1.

ROLFE, R. A.—Notes on Carruthersia and Voacanga, *Jour. Bot.* 21. 200.

SCRIBNER, F. LAMSON.—A list of Grasses from Wash. Terr. (2 new species, with cuts), *Torr. Bull.* 10. 63.

SHALER, N. S.—The American Swamp Cypress, *Science*, 2. 38.

STAHL, E.—Influence of Sunny or Shady Places upon the Formation of Foliage Leaves, reviewed by Wortmann, *Bot. Zeit.* May 18.

TANGL, E.—On the Division of the Nucleus in Spirogyra (with 2 plates), *Akad. d. Wissens., Wien*, 85. 268.

TOWNSEND, FREDERIC.—Review of his "Flora of Hampshire," by James Britten, *Nature*, 28. 122.

TRELEASE, WM.—On the Structures which favor Cross-fertilization in several Plants, reviewed by Hermann Müller, *Bot. Zeit.* June 1.

TSCHAPLOWITZ, F.—Is there an Optimum of Transpiration? *Bot. Zeit.* June 1.

WILLIAMSON, W. C.—On Morphology of the Pitcher of Cephalotus follicularis, *Nature*, 28. 140.

WINTER, G.—On some N. Am. Fungi (4 from Ill., 4 from Ky.), *Hedw.* May.

ZALEWSKI, A.—Upon the Formation and Separation of Spores in Fungi, *Flora*, May 21, cont. June 1.